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ing it again, was found to have lost one dram, 6 grains. Dec. 3, Mr. Arthur Bayly, one of the Fellows of the R. Society, presented them with a piece of this Linnen in the name of Mr. Waite. At the same time, the same Mr. Bayly presented Dr. Plot with another piece of it, which being brought to Oxford the Experiment was again repeated on it (Dec. 16.) it being put into a strong Charcoal fire in the Natural History School, in a full meeting of the Philosophical Society of that University; where after it had continued red hot for some considerable time, it was taken forth again little altered when cold, faving that it seemed a little whiter and cleaner than before it was put in; as appears upon the Journal of that Society. Concerning which, Dr. Plot, being desired to offer his thoughts, drew up the following Discours, which was read before the faid Society, June the 23d An. 1685.

A Discourse concerning the Incombustible Cloth above mentioned; Address't in a Letter to Mr. Arthur Bayly Merchant, and Fellow of the R. Society; and to Mr. Nicholas Waite, Merchant of London; by Rob. Plot. LL. D.

Worthy Gentlemen.

HE Historical account of the incombustible Linnen Cloth above mention'd, being sent me by the one of You; and a noble present made me of part of it by the other; with a desire from both, that I would search the old Authors and see how agreeable their relations are to this; give you Both a just right to the following Discourse: which I desire you would believe I address to you, not so much out of Complement, as true gratitude for so valuable

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a gift. It being esteemed by the Ancients, though then more common, and perhaps better known, then tis yet amongst us, equally pretious with the best of Pearls.

Nor is it now of mean value even in the Country where made, a China Covet, (i. e. a piece 23 inches and 3 long,) being worth 80 Tale i. e. 36th. 135. 4d. But that which much enhansed its worth with me, was, that hereby you put me in a capacity of giving full satisfaction to this famous University of the reality of the thing; whereof, I cannot blame them, if some did doubt; since we find very good Authors to have done the same: who though they owned such a mineral as Amiantus, out of the woolly part whereof this fort of Linnen was always anciently faid to be made, yet questioned the possibility of its having been actually done: Dalecampius holding it very incredible, that it should be moven into cloth, by reason of its brevity b; and Schildius in his Commentary upon Suetonius absolutely denying it, Multi falso sibi Linteum quoddam documentar, being his very words. Xuerius Boxhornius does not indeed deny but that there might be such Linnen amongst the Indians, where the materials of it grow; of which they might make them funesal shrouds wherein to enwrap the bodys of their Princes (as they say the ancient manner was) and so preserve their Albes distinct from those of the Pyra in which they were burnt: but he is peremptory that the Romans never used any such d; and so is I/aac Ca/aubon. whereof I shall not dispute: but whether they did or no, I am sure they might, had they pleased; for Pliny says expressly (and I dare believe him in any thing he ipeaks of his own knowledg) that he himself had seen Napkins thereof, which being taken foul from the board at a great feast, were cast into the fire, by which means they were better scoured, and looked fairer and cleaner, then

<sup>2</sup> C. Plinii 211 Nat. Hist. Lib. 19. c. t. b Jac. Dalecampii notæ in locum supra citat. c. Joh. Schildii notæ in C. Suet. Tranq. Lib. 2. d M. Kuerii Boxhornii Quest. Rom. Quæst. 25. e Is. Casaub notæ in Suct. Lib. 2. p. 186.

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if they had been wash't in mater'. Now if they had such Napkins, they might no question have had sheets of it too, and put them to the use above mention'd had they thought it expedient, as, 'tis said in the Letter above, the Tartarian Princes, and others adjoyning, doe

at this very day.

That this Linnen was very well known to the Ancients, beside that of Pliny, we have the further testimony of Calius Rhodiginus, who agrees with the Letter, placing both the materials and manufacture of it in Indias; and Paulus Venetus more particularly in Tartary, the Emperour whereof, he says, sent a piece of it to Pope Alex-It is also mention'd by Varro; and Turnebus in his Commentary upon him, de Lingua Lati. And by all of them as a thing inconfumable by fire. In these latter ages: Geo. Agricola tells us, that there was a Mantle of this Linnen at Vereburg in Saxony k; and Simon Majolus fays, he saw another of it at Lovain exposed to the fire. Salmuth also acquaints us that one Podocattarus a Cyprian Knight shewed it publickly at Venice, throwing it into the fire without scruple or hurt "; and Mr. Lassells saw a piece of it in the curious Cabinet of Manfred Septalla, Canon of Milan. Mr. Ray was shewed a purse of it by the Prince Palatin at Heidleberg, which he saw put into a pan of burning Charcoal till it was throughly ignite, which when taken out and cool, he could not perceive had receiv'd any harm o; and we are told in the Burgundian Philosophy, of a long Rope of it, sent from Signior Bocconi to the French King & kept by Monsieur Marchand in the Kings gardens at Paris, which though steeped in oyle&put in the fire, is not consumed p. To which add, that we have now seen a piece of this Linnen, pass the fierry triall both at

f C Plinii 2<sup>41</sup>. Bib. 19 cap: 1 g Czlîi Rhodigini Lestionum Antiq. Lib. 18. cap. 31. b. M. Fauli Veneti de Regionibus Orientalib. Lib. 1. cap. 47. i Andr. Turnebi Comment. in Varr. & Lingua Lat. k. Geo. Agricole de natura Fosfilium Lib. 5. l Sim. Maioli dierum Canicul. part. 1. colloq 20. m Hen Salmuth in Pancirolli rer. deperdit. Tit. 4. n Rich. Lassels Voyage into Italy Parr. 1. o. Ray's Observat. Topograph. &c. pap. 83. p Philosoph. Burgund. Tom. 5. Tract. 3. cap. 5.

London, & Oxford. So that it feems to have been known in all ages, all describing it after the same manner, as a thing so insuperable by fire, that it only cleanses and makes it better.

It being clear then beyond controversy, that there always was, and now is such incombustible Linnen; it cannot but be worth while to consider it nicely, and in its full extent, which I shall doe first in giving some account of the notation of the Names of the lanuginous mineral of which 'tis made, and the places where found. 2. of its natural principles. 3. of the manufacture of it into thread cloth, &c. 4. of the variety of uses it has been put to. and 5. of the reason why incombustible. all these with as much brevity, as perspicuity will admit of. First then as to the notation of its Names whereof it has many, taken from its qualities, colour, texture, and places where found; It is called first (from its strange qualities) sometimes Amiantus, quod in ignem injectus non mairerus, the fire being so far from defileing it, that it rather gives it a lustre. 2. It is call'd Ashestos. and 3. Salamandra, in English Salamanders wool; I suppose from the thryallides or Candle-Wieks said to be anciently made of it, which being put into Lamps of such inconsumable oyl, as is mention d in the Letter, would never wast, or goe out; which I take to be the true reason of the impofition of these Names upon it, whether there ever were any such Lamps or noe. For as for the stone Asbestos or Apfyctos mention d by Solinus q, Ifodore r, Salmasius i, and Maiolust, found in Arcadia of an Iron-colour, which they all fay if once heated, can never be extinguish't or cooled again; it must be a quite different thing from ours, then which nothing is extinguish't, or cooled sooner. Nay so far is it from being the same with our Asbestos, that

g Julii Solini Polyhist. Cap. 12. r Isodor Epise. Hispal. Orig. Lib. 16. Cap. 4. f Cl. Silmani Exercitat. Plin. in C. Jul. Solini Polyhist. 1 Sim. Maioli Colloq. Phys. admirand. Colloq. 18. & 22.

strictly speaking, I dare boldly say, there was never any fuch thing in nature: Notwithstanding what Metaphra (tes tells us of it, relating to St. George the Megalo-Martyr, Patron of the English; who being condemned to be burnt by his wicked persecutors, that had seen many miracles done in the name of Christ, fearing the virtue of that Name might extinguish the common fire, As besto lapide Sanctum obruerunt, cover'd him all over with Asbestos stones which they thought could never be extinguish't u, For I guess with Bollandus it was nothing else but Calx viva w; or unstaked Lime, which kept dry will indeed retain its fiery particles for a long season; or else some fuch stone as the Asydos of Pliny which once heated will hold so for a week x, like the Ruggiola's of Spain (which are broad plates, like tiles, cut out of a Mountain of red Salt near Cardona) that being heated on both sides will keep warm for a whole natural day, or our Cornisb warming stone which will hold heat for 8 or 10 hours; All, or any of which, per Synecdochen partis, may in some sense be call'd Asbestos well enough. Yet Hodore and Maiolus both tell us of a Lamp that hung somewhere in a Temple of Venus, that had a wiek of such Asbestos, that no tempest either of wind or water could possibly extinguish z; and we are told that the Lamp found in the tomb of Pallas the Arcadian slain by Turnus in the Trojan War, was of this kind, it remaining burning after it was taken forth, notwithstanding either wind or water, with which some did endeavour to quench it 2. Which Histories must either be false, or the Lamps must have Wieks of some different kind of Asbeltos from ours; which is easily extinguisht; and from a pungent quality Agricola says it has on the tongue without astringency, is otherwise call'd Alumen, having the distinguishing Epithet [plumeum]

Ll

added

u Sim. Meta phrastes in Encomio Sti. Georgii apud Lipoman. Tom. 7. in Apr. 23. w Bollandus in asta Sanstorum. Apr. 23. 2. x C. Plinii 2 ii. Nat. Hist. Lib. 37. cap. 10. y Fr. willughby's Voyage through Spain. p. 471. z Isidor. Episc. Hispal. Orig. Lib. 16. cap. 4. & Sim. Maioli colloq. Phys. admirand. colloq. 18. s Fortun. Liceti. de Lucern. Lib. cap. 11. b Geo. Agricola de Natura Fossilum Lib. 5.

added to it, taken from its downy filaments, to discriminate it from all the rest of the Alums.

From the light gray colour of its lanuginous parts, it is calld by some Polia; by others Corfoides; and from its likeness to the heavy fibres of some fort of Matweed, Spartopolia. From the capacity it has of being foun into thred, it is also calld Linum, with some distinguishing Epithet taken either from its quality, such as as bestinum, or vivum'; or from the place where found, in general or particular: it being calld in general Linum fossile; in English, Earth-flax and in particular Linum Indicum by Calius Rhodiginuse; Linum Creticum by Strabof; Linum Cyprium by Pancirollus g; also Carpasium by Plutarch and Rhodiginus, from Carpasia a City in Cyprus, near which it is found h; and Linum Caryfium, by Paufanias from a Town of that name in Negropont where it was also dugg k. But beside these places that have given Epithets to the thred made of it, it is also found in Tartary, as M. Paulus Venetus 1 and Mr. Waite agree; and as Agricola informs us, at Namur in the Lon-Countries; at Eisfeld in Thuringia; amongst the mines in the old Noricum; somewhere in Ægypt, and in the mountains of Arcadia m; Also at Puteoli as John Hessius acquaints, and lately in some mines in Italy by Signior Marco Antonio Castagna. To which we may add our own Country, it having been yet latelyer met with in a small Island belonging to William Robinson Esq; called Ynis Molroniadi. e. the Island of Sea-calves, in the parish of LLan-Fair yng Hornwy in Anglesey in Wales.

Secondly as to the natural principles of it, though it be commonly by the Lithographers reckon'd among stones, I rather should judg it a terra lapidosa or middle substance

e Ibidem. dC. Plinii 2.1. Nat. Hist. Lib. 19. cap. 1. e Cæl. Rhodigini Lect. antiq. Lib. 18. cap. 31. f Strabonis rer. Geograph. Lib. 10. g. Guid. Pancirolli rer deperdit. Tit. 4. h Cæl. Rhodigini Lection Antiq Lib. 14. cap. 18. k Vid. Geo. Agricolæde Nat. Fossil. Lib. 5. l Mar Pauli Venet. de Reg on b. Oriental. Lib. 1 cap. 47. m Geo. Agricol Ibid. n Pet. Andr. Matthioli Epist. Lib. 3. sphilosoph. Transact. Numb. 166.72.

between a stone and an earth; but whether the one or the other, made of a mixture (I guess) of some Salt or other, and a pure earth without Sulphur, coagulated in the winter, and harden'd to perfection by the heats in Sum-Which Salt Johannes Hessus proves by a very cogent argument to be Alumen liquidum, describing it, as Matthiolus also doesp, to be a whitish lasteous substance fomewhat inclining to yellow, that sweats out of the earth, and fmells like Rotten cheese: whereof having gather'd a quantity at Puteoli, together with the other Species's of Alum, and kept it a while by him, when he came to look on it again, he found it to have lost the smell, and a great part of it changed into Alumen Plumeum 4: the Saline part (I suppose) shooting into threds, and the pure earth uniting them, as found in the places wherever generated: whether sweating from the earth as Pliny and Matthiolus would have it; or percolated through rocks, as we find it in Wales, the veins of it there running through a rock of stone in hardness and colour not unlike flint . And yet it feems to be made of much fuch an Alum as that of John Hessus at Puteoli was, some of it being strawcolour'd, as if it still retain'd the yellowness that his liquid bitumen was faid to have: which is a colour not given it by any Author, most of it being said to be white or cinereous; some of it red; and some of an Iron colour as Apricola tells us t; and I have some of the Cyprian by me sent from Aleppo by my worthy friend Dr. Rob. Huntington now Provost of Trin. Coll. Dublin whereof some is of a light blew or pearl-colour; and some of it has a cast of Sea-green. But however the whole mineral substances found at several places may differ in colour; yet I doe not find but the woolly part of them all seems to be much the same, viz. of a white Silver colour, the threds very fine

p And. Matthioli Comment. in Lib. 5. Discor, cap. 82. q Andr. Matthioli Epistol. Lib. 3. r C. Plinii 24. Nat. Hist. Lib. 35. cap. 15. & Andr. Matthioli Comment. in Lib. 5. Dioscor, cap. 82. f Philosoph. Transact. Numb. 166. t Geo. Agricolæ de Nat. Fossil- L. 5.

and flender, yet very ponderous, the smallest particles of them throughly wet, sinking in mater; as I also found a very slender thrumm of the Incombustible Linnen given me by Mr. Baily; which Mr. Waite brought from India, would also doe: which renders it very probable that it is not a vegetable, but a mineral substance, notwithstanding the informations of Conco and Keay-arear Sukradana mention'd in Mr. Waite's Letter. I say, renders it probable, there being several woods, such as Box, red-wood, Persian wood, "&c. that will sink in water.

Concerning the manufacture of it into thred, cloth, &c. our Letter is filent, but Marcus Paulus Venetus very luckily supplyes this defect, acquainting us in his book de Regionibus Orientalibus, how, it is made in Tartary it self: where he says it is found in a certain mountain in the province of Chinchinthalas, and made into cloth, as he was inform'd by one Curficar a Turk who was Superintendent of the Mines in that Country, after this manner. The Lanuginous mineral or Amianthus being first dryed in the Sun, is next pounded in a brass mortar, and the earthy part separated from the moolly, which is afterward walht from all filth whatever that may yet stick to it, and so, being thus purged, is then (pun into thred like other wool, and after wove into cloth: which if foul or spotted, they cleanse, he says, by throwing it into the fire for an hours time, whence it will come forth unhurt, as white as Snow w. Which very Method (as Strabo prefcribes it) feems also to have been used in ordering the Cretan Amiantus, only with this addition, that after it was pounded, and the earthy part shook from the wooly, he fays twas comb'd, and so does Agricola, which argues there was some of a greater length than any I have yet feen \*: what the Cretan might be I cannot tell, but the Cyprian I am sure is short enough, so is the Wellh, and so

<sup>2</sup> Philosoph. Transact. Numb. 169. 28 Mar. Pauli Veneti de Regionibus Orientalibus Lib 1. cap. 47. 2 Sersbonister Geograph. Lib. 10.& Geo. Agricola de Nat. Possil. Lib. 5.

was all that was known in Pliny's time, who confesses it was very difficult to meave by reason of its shortness, difficile textu propter brevitatemy: insomuch that I guess they used some Art to effect it, not discover d by Authors, spininng it perhaps first together with Tow, and so weaving it into cloth, by which means its likely it might hang together after twas moven, the tow being burnt away upon the first exposing it to the fiery triall; or else if they spun it alone, perhaps they might moisten it with Gummater, or some other such glutinous liquor, to make it hang the better together, during the spinning and morking it into cloth, which though burnt away upon the first experiment, yet the Amiantus once moven, in all probability might then hang together well enough of it self.

Thus having shewn the Method how anciently, and how possibly this mineral may be spun into thred, and consequently work't into cloth in our Age: let us next consider to what uses it ever was, or may be put. As to the former whereof Pliny informs us, that Shrouds of this Linnen were anciently used, at the Royal Obsequies of K. K. to wrap up their Corps in, so as that the ashes of their bodies might be preserved distinct from those of the mood which made the funeral Pile; and the Letter acquaints us that the Princes of Tartary, as Keay-arear Sukradana was credibly informed, doe nie fuch at this day for burning their dead: which I have had so well confirmed from other hands fince my receipt of that Letter, that I have little reason to doubt of the thing; there being no incapacity on the part of the cloth: of which though, as the Letter fays, some is not so good as the rest (as 'tis in most other commoditys) yet I doe not find there is any so bad, but will to far refift the fire, as to perform this office: for though it must be acknowledged it does dimini/b every time it un-

dergoes the violence of the fire; yet this hinders not but, it may, and will, doe that Service divers times, before it be renderd altogether useless. Calius Calcagnanus says. that some of the Ancients made them cloths of it z; with whom agrees Turnebus in his Commentary upon Varro 3; and Calius Rhodiginus tells us indefinitly that the Indians did make them Garments of it b; but Hieracles restrains it to the Brachmans only. The Wieks for the Perpetual Lamps of the Ancients were also made of this, as the same Rhodiginus further acquaints us; the Wiek of the golden Lamp of Callimachus that hung in Acropoli being made (as he says) è Lino Carpasio, of which the fire had no powerd. The Emperor Constantin also, as Damasus informs us, appointed a Wiek to be made of this incombuftible flax, which should perpetually burn in his Baptistery at Rome . And Ludov. Vives bears us Witness, that he faw many of these in Lamps, at Paris, that would never consume h. That Napkins, Mantles, a Purse and Rope have been made of it, has been shewn already; and we are told that Septalla, Canon of Millan had thred, roaps, net-works, and Paper of it . Marco Antonio Castagna, who lately found this mineral somewhere in Italy, knows how to prepare, and render it so tractable and soft, that it resembles well enough a very fine Lambs-Skin, which he can thicken and make thin to what degree he pleaseth, and maketh it thereby, like either to a very white Skin, or a very white Paper k. We have also made paper of our Wellh Amiantus but lately here at Oxford, which will bear both fire and Ink well enough, the Ink only turning red by the violence of the fire 1.

Lastly, to shew the reason whence it is, that this sub-

<sup>2</sup> Cælii Calcagnini Epifol. Quæft. Lib. 3. Epift. 1. a Andr. Turnebi Comment. in Varr. de Lingua Lat. b Cælii Rhodigini Lection. Antiq. Lib. 18. cap. 31. c Vid. Geo. Agricolæ de Nat. Fost. Lib. 5. d Cælii Rhodigini Lection. Antiq. Lib. 14. cap. 18. e Damas, in Sylvestr. Pap. b Ludov. Vives in Scholio ad D. August. de Civitat. Dei. Lib. 27. cap. 6. i Museum Regalis Societat. Part. 3. chap. 5. k Philosoph. Transact. Numb. 72. l Philosoph. Transact. Numb. 166.

stance should be so strangely privileg d by nature, as to be wholy put out of the power of fire: we must consider first (that we doe it with clearness) the Qualities and power of fire it left; 2. the condition of the things most lyable to fire; and then 3. what things they are that relift it most, and remain after it has exercised its ultimat The qualities then and power of fire according to Aristotle are, Αμακρίνον τα μι διμόφυλα, συθκρίνον θε τα διμόφυλα m. to separat things of a different, and unite those of alike nature. 2 The Subjects most apt to take fire and be dissolved by it, we find to be fuch heterogeneous bodies, in whole pores the most Sulphureous bituminous, and aqueous particles are lodg d; which being feized by fire, are quickly put into motion, dilated, separated, and being thus made capable of flying away, are at last confumed; and dissolve the frame of those bodies whose parts before were united by them. When these are fled and gone, the fire naturally goes out, as having nothing now left to work upon, nothing remaining, but the Salts and Earth in the form of Albes: which 3. in all forts of compounds are the things that refift this Element most, and will remain after the most exalted operation it can be forced to. Nor doe the Salts only of mixt bodies thus baffle the force of fire, but the simple ones much more, as being more homogeneous, as we see in the decrepitation of common Salt, and exsiccation of Vitriol, which when the aqueous parts are once evaporated, are now a pure simple homogeneous body, no more sensible of the fire, the decrepitation ceasing, and nothing remaining that can be dilated, any further to break the corns of Salt. Now whatever the fire cannot dilate, it cannot feparate, nor consequently destroy, or carry any thing from it, but what is heterogeneous and accidentally adhering to the outfide of it: which is perfeetly the case of our incombustible Linnen, whose threats

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being altogether homogeneous, and nothing else but the pure strike of liquid Alum, as was shewn above, holding nothing of Sulphur, bitumen, or water, or any thing that is different or heterogeneous to it self, that can be dilated or separated, it is in no possibility indeed of being lyable to the fire: which may indeed pass through it, as we see it does when 'tis made red hot, but can carry nothing from it; but such accidental filth as has been put upon it, or accrewed by useing.

And thus Gentlemen I have run through the several branches laid down above, according to the capacity of the subject, and my self; wherein it I have done well, you have your desire; it ill, you see I have not scrupled to hazard my reputation, to serve my Friends; so that I hope you will believe without a Complement, that I really am,

Your most humble Servant, R. P.